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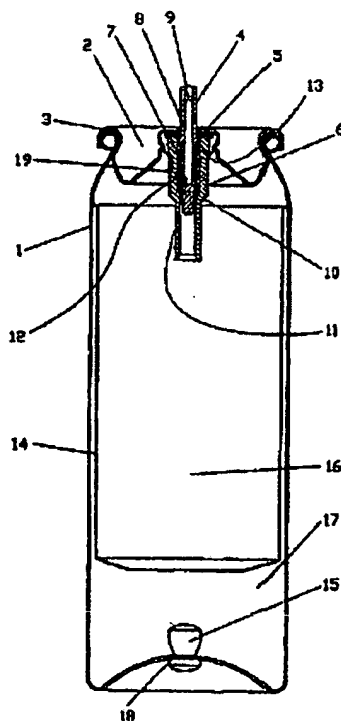
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## TWO-CHAMBER SYSTEM WITH METERING VALVE

(57) Abstract:

Two-chamber system with metering valve for dispensing defined amounts of a fuel being held under pressure in a bag (14) by a propellant present in a space (17), the fuel being dispensed into a combustion chamber of a working device, especially a power fastening tool for setting fastening elements, characterized in that the metering space (19) for dispensing the defined amounts of fuel is located either inside the bag volume (16) or in an area of the fuel-containing bag (14) where it can be connected to the bag volume (16).



## Two-Chamber System with Metering Valve

The invention pertains to a two-chamber system, provided with a metering valve and serving as a fuel container for a dispensable fluid such as a hydrocarbon for use with fuel-operated power fastening devices according to the introductory clause of Claim 1.

In power fastening devices of the type indicated, drive energy is provided by the internal combustion of, for example, a fuel/air mixture, this energy being transmitted by a piston to the fastening element, which can be in the form of, for example, a nail, a bolt, etc.

As described in US-A-4,403,722; 4,483,474; 4,522,162; and DE 199-50,350, it is known that a fuel container can be used to dispense a fuel such as a hydrocarbon to a gas-operated fastening device. The inner bag of a fuel container of this type is made out of a flexible, laminated, multi-layer sheet. The sheet can have an outer layer of Nylon or polyester, an intermediate layer of aluminum foil, and an inner layer of polyethylene film with suitable bonding layers between the aluminum and the other layers. The valve units on these fuel containers are designed as continuous-spray nozzles; that is, when the valve is actuated, the fuel flows out until the bag is completely empty. So that the amount of fuel can be metered, an additional metering unit is inserted between the fuel container and the power fastening device; this metering unit is usually connected directly to the fuel container.

The additional metering unit required increases the cost of manufacturing the gas-operated fastening device and always leads to leakage between the fuel container and the metering unit when the fuel container is replaced.

The invention is based on the task of creating a two-chamber system with metering valve, by means of which the design of a gas-operated fastening device can be simplified and the leakage which occurs when the fuel container is replaced can be avoided.

This task is accomplished according to the invention in that the metering space for dispensing the defined amounts of the fuel is located either inside the bag volume or in an area of the fuel-containing bag where it can be connected to the bag volume.

This task is accomplished in accordance with the characterizing clause of Claim 1.

Additional embodiments of the invention can be derived from the following description and from the subclaims.

The invention is explained in greater detail below on the basis of an exemplary embodiment, which is illustrated in the attached figures:

- Figure 1 shows an axial cross section through a two-chamber system with metering valve, the valve being in the closed position; and

- Figure 2 shows a partial axial cross section of a two-chamber system, the valve being in the open position.

The two-chamber system with metering valve shown here comprises a valve cover 2, which is crimped onto the upper end of the container opening in a manner known in and of itself, where an elastic seal 3, preferably made of a synthetic rubber such as Buna N which is essentially impermeable to propellants, is provided between the container 1 and the valve cover 2. A thin-walled bag 14, preferably of aluminum, is rolled onto the inside wall of the container and around the crimped area, the portion of the bag attached to the inside wall extending down to a point just below the valve cover 2, so that the container 1 thus becomes a two-chamber system. A bag volume 16 is formed as a chamber for the fuel, and a space 17 is formed between the bag 14 and the container 1 as a chamber for the propellant. It is advantageous for the pressure difference between the bag volume 16 and the space 17 to be adjusted so that preferably an excess pressure of approximately 2 bars is present in the space 17. As a result, the continuous compression exerted by the propellant in the space 17 ensures that the fuel in the bag 14 will not convert to the gas phase; it will remain in the liquid state, so that it can be metered uniformly. The space 17 is filled through the opening 18 in the bottom of the container and sealed by the plug 15. The bag 14 is filled with fuel through the valve needle 4 of the metering valve.

The valve cover 2 holds a valve body 6, which is sealed off from the valve cover 2 by an elastic disk 5. A valve needle 4 is provided in the valve body 6; a compression spring 7 presses the valve needle 4 via its support surface 13 axially

against the elastic disk 5 and thus holds the dispensing valve in the closed starting position. The valve needle 4 can be actuated from the outside; that is, the valve needle can be pushed in the axial direction against the force of the compression spring 7 and shifted within the valve body 6 out of the closed position and into the open position as shown in Figure 2 and vice versa. The compression spring 7 is supported on a seat in the lower part of the valve body 6 and also against the valve needle 4.

In the closed position of the valve shown in Figure 1, a gap 11 is formed between the valve needle 4 and the valve body 6, as a result of which the metering space 19 will fill with liquid fuel. When the valve needle 4 is actuated as indicated in Figure 2, the valve needle thus being moved against the force of the spring, the outer lateral surface 12 of the valve needle comes in contact with the ring-shaped, cross-sectional constriction 10 on the valve body 6, which has the effect of sealing the gap fluid-tight. The metered amount of fuel can now escape from the metering space 19 by passing through the opening 8 and entering the following bore 9 in the valve needle 4, from which it can then proceed to the known combustion chamber (not shown) of a power fastening tool.

The two-chamber system can also consist of one of the known valve-bag systems (not shown), in which the bag is attached to the valve and not to the can.

As a result of the two-chamber system with metering valve, the design of the overall system of the gas-operated fastening tool is considerably simplified, and no leakage can occur between the fuel reservoir and the metering unit.

### Claims

1. Two-chamber system with metering valve for dispensing defined amounts of fuel being held under pressure in a bag (14) by a propellant in a space (17), the fuel being dispensed into the combustion chamber of a tool, especially a power fastening tool for setting fastening elements, characterized in that the metering space (19) for dispensing the defined amounts of the fuel is located either inside the bag volume (16) or in an area of the fuel-containing bag (14) where it can be connected to the bag volume (16).

2. Two-chamber system with metering valve according to Claim 1, characterized in that the edge area around the open end of the bag (14) is rolled onto the upper area of the inner lateral surface of the container (1), near the opening.

3. Two-chamber system with metering valve according to Claim 1, characterized in that the bag (14) is attached to the valve body (6).



